

# 7 CLIMATE CHANGE

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## 7.1 INTRODUCTION

Although not specifically included in the UWMP Act, Triunfo Sanitation District/Oak Park Water Service (District) has opted to address the potential impacts of climate change on the water system. It is noted in the *Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan* that “inclusion of potential climate change impacts in a water supply planning document is consistent with other water supply programs and environmental requirements being implemented in California.”

Due to the fact that this section does not require specific information or topics to be discussed (as previous sections of the TSD UWMP do), the following topics will be covered:

- General Overview of Climate Change
- Effects of Climate Change
- Minimizing the Effects of Climate Change

Each of these sections will discuss the long term impact (outside of the 20 year scope identified in the prior sections).

## 7.2 CLIMATE CHANGE OVERVIEW

Although there is still some debate about the causes and effects of climate change, and even whether or not it exists, the general consensus among the scientific community is that climate change is a threat to our global climate. Climate change is a major environmental threat that is expected to result in a multitude of long term weather changes and short term weather events. The specific impacts of climate change vary greatly by region and current climate. Due to the unpredictable nature of climate change, general statements will be made in accordance with recent observations and predictions made by climate scientists.

It is generally accepted that the leading factor resulting in climate change is the emissions of greenhouse gases (GHGs). GHGs include nitrous oxides, sulfur oxides, carbon oxides, and methane, among many others. Due to the large amounts of carbon dioxide emitted in electricity

production by coal and transportation based on combustion of petroleum, effects and trends of carbon dioxide levels in the atmosphere on climate characteristics are studied heavily.

An increase in GHGs is expected to lead to climate change through a process called the Greenhouse Gas Effect. As radiation from the sun is emitted to earth, a portion of it is absorbed; the rest bounces off the surface and, in a natural process, is emitted to space. The Greenhouse Gas Effect describes the process where the radiation that would typically be emitted back to space is reabsorbed in the atmosphere by the chemicals known as Greenhouse Gases. When the radiation is reabsorbed, it is consequently reemitted back to the earth. This additional radiation that would have otherwise been emitted to space is generally accepted as the source of what we know as climate change. The GHGs emitted by the population serve as a “blanket” that holds in the sun’s radiation, and ultimately causes heat to become trapped with long term impacts on the climate.

### 7.3 EFFECTS OF CLIMATE CHANGE

Climate change is expected to have a wide variety of both short and long term impacts. These impacts will vary greatly based on geographical location and current climate. Some areas are expected to see severe decreases in average temperature and an increase in rainfall, while others are expected to experience the opposite. There is some debate about where the State of California will fall in these patterns; however it has been observed that average temperatures are increasing and weather events are becoming more intense. The Department of Water Resources has done extensive studies on climate change. Some of the findings about what has been already observed as a possible effect of climate change, as well as what is expected in the coming years, are summarized below.

#### **Wet Weather Events**

Two extremes are expected, and have been observed, when looking at the possibility of climate change. The first of these extremes is the occurrence of wet weather events such as storms and floods. These are expected to increase in both intensity and frequency. This not only impacts the water supply by overwhelming storage, it can impact infrastructure as well. California has a series of natural and manmade flood barriers that serve to protect the population and infrastructure while simultaneously assisting to help store some of the runoff water. However, as floods increase in intensity, due partially to the increased rate of melting snow (a large, natural water source for California’s water), flood protection can be overwhelmed.

In addition to floods, severe storms are likely to be an effect of climate change. While these

pose similar threats to the water supply and infrastructure as floods by causing large amounts of water flow at one time, they also increase the likelihood of events such as mudslides that are known to cause extensive property damage and, in some cases, loss of life.

### **Dry Weather Events**

In the long term, dry weather events are likely to have the most impact on the lives of California residents. Droughts are a natural occurrence in the State of California, characterized by short term (approximately 1-3 years) periods of warmer than average temperatures and reduced rainfall. Droughts have a devastating impact on the water supply reliability. Furthermore, as water storage is continually tapped at a rate much higher than water replenishment is available, decreasing availability of a clean source of water becomes a threat. The general population's lives are directly impacted by these events, requiring normal water use patterns to decrease sharply.

In addition to a reduction in water supply, droughts are also known to cause an increase in water demand due to warmer temperatures and extended growing seasons. These water demands are likely to cause additional strain on the already dwindling resources.

Although the impacts of droughts are considered in Chapter 5 of this Urban Water Management Plan, climate change has the potential to cause droughts more severe than these. Therefore, Section 7.4 will analyze the potential effects of severe and recurring droughts on water service reliability.

### **Decreased Snowpack**

Among the effects a drought is expected to have on the overall water supply, the possibility of decreased Sierra Nevada snowpack is a long term water supply issue. The Sierra Nevada snowpack is the largest water "reservoir" for the State, providing an annual average of 15 million AF. The snowpack is released as temperatures increase in the spring and summer months and melt the snow. Climate change affects this process in two ways. First, the snowpack is reduced due to warming temperatures causing less snow to fall. Instead, the precipitation is released as rain, and potentially cannot be captured and stored in reservoirs. This reduces the total stored water as snow in the Sierra Nevada. The DWR predicts a 25 to 40% decrease in snowpack in the Sierra Nevada by 2050. Furthermore, as temperatures rise, the snow that is stored is released at an accelerated pace. The DWR notes that water infrastructure was designed to handle the predicted pace of the snowmelt. However, as snowmelt rates increase, water may overwhelm the system and be lost.

### Sea Level Rise

The melting of the ice caps is a strong contributing factor to the rising of the sea level. The immediate consequences of this are recognized at the coastal California cities, where the impacts from flooding and storms are amplified. More significant to the District is the possibility of seawater intrusion into the groundwater supplies that eventually supply the Oak Park Water Service. Seawater intrusion immediately impacts the groundwater quality and increases the need for further water purification and development of supplies.

### Water Quality

Water Quality effects due to climate change are predicted to occur due to two extremes: flooding and droughts.

Flooding and higher runoff at any given time has been predicted to increase erosion and, therefore, increase the amount of sediment and contaminants in the water supply. This has the potential to increase the strain on water suppliers due to the increased need for water purification.

Droughts and lower runoff have the potential to increase the concentration of chemicals that may be present in water streams. Streams of water collect chemicals that exist in the environment. As water runoff decreases, the same quantities of these chemicals are collected in smaller amounts of water, increasing the overall concentration. As the chemical concentrations rise, the purification requirements rise with each gallon of water, and increase the risk for dangerous fluctuations.

## 7.4 MINIMIZING THE EFFECTS OF CLIMATE CHANGE

Many of the potential impacts of climate change have already been observed. In addition, models show that current GHG levels will continue to amplify the effect of climate change over the next few hundred years, even if all GHG production were to cease today. In order to minimize the impacts of climate change, innovative solutions must be developed. These solutions fall within two categories. The first strategy is mitigation. For water suppliers, this is the ability to reduce GHG emissions. The second is adaptation; the strategy of adjusting our water supply system to meet water demands as a result of permanent climate change.

## Mitigation

In addressing climate change, mitigation is the effort to increase efficiency and reduce the output of GHGs. Although no individual sector is fully responsible for implementing mitigation efforts in an attempt to eliminate GHG production, each industry can develop its own techniques to help reduce the impacts that climate change may have. The common goal throughout the world's population in regards to mitigation is to eliminate production of GHGs. Currently, this is being done by exploring ways to increase efficiency, decrease demand, and develop alternative and renewable energy sources that will reduce the impact of burning fossil fuels.

For the water distribution sector, mitigation can be done by minimizing the transportation of water. Water is a dense liquid that requires a substantial amount of energy to move around. Because of this, distribution systems are complicated and require large pumps. Electrical devices such as these pumps have an associated level of GHG emissions associated with the energy input they require. To mitigate the GHGs associated with this, the District can minimize the amount of water required for distribution by encouraging demand reduction. Current demand reduction efforts are discussed in Chapter 6. Maximizing the efficiency of the water used not only preserves water supply, but can help in reducing the overall impacts and severity that is expected in the coming years as a result of climate change.

## Adaptation

Adaptation is the strategy employed to adjust to the environmental impacts of climate change. Although not a desirable solution, this is necessary as the impacts of climate change are already beginning to take effect. Adaptation can help the population continue to thrive and minimize the potential negative consequences that result from climate change.

Although adaptation strategies for the District in terms of water service are not available, as water is supplied through wholesale suppliers, general adaptation strategies to increase water reliability have been identified by the State of California. These include adjusting designed flow rates of SWP infrastructure to ensure that all water is captured and able to be utilized with increased snowmelt and more intense precipitation periods.

Other adaptation strategies proposed by the State of California that may help in increasing the reliability of supply to TSD regardless of climate change include:

- Fully developing Integrated Regional Water Management planning to evaluate supply and demand, and encourage water districts to work together to ensure that a broad water supply is available, increasing water reliability.

- Promoting integrated flood management to decrease the impacts of floods and utilizing natural flood plains where available. Adapting to climate change in response to the threat of floods increases the economic and social wellbeing of the State, especially those in high risk zones.
- Assisting to sustain ecosystems which provide clean and reliable water. Maintaining diverse ecosystems and preventing the potential destruction of these water sources will help increase their predictability and reliability.
- Focusing on impacts at the Bay-Delta. The Bay-Delta is the source of water for a majority of Californians. Ensuring that a healthy ecosystem and that water quality at the Bay-Delta are maintained despite the effects of climate change is imperative towards continuing to use this as a source of water.
- Planning for rises in the sea level. As sea water intrusion to water resources becomes a threat to water quality, establishing a reliable system of levees and flood management programs is necessary to maintain water supplies and ensure the safety of the State's population.